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等通道彎角擠製之有限元素分析與模具製作

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摘要

等通道彎角擠製為利用模具幾何形狀、材料性質與加工條件來獲得材料的剪力塑性變形。本文使用剛塑性有限元素 DEFORMTM 2D 軟體研究 Ti-6Al-4V 鈦合金於等通道彎角擠製加工的塑性變形行為，在不同擠製條件下，包含模具轉彎之夾角與摩擦因子等，以分析胚料等通道彎角擠製後之破壞因子分佈、有效應力與應變分佈等。最後設計兩組(phi=90 度和 phi=120 度)等通道彎角實驗模具來驗證之。

關鍵字: 有限元素;鈦合金;等通道彎角擠製

Finite Element Analysis and Processes of Experimental Die Set of Equal-Channel Angular Extrusion

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Abstract

The shear plastic deformation behavior of a material during equal-channel angular (ECA) extrusion is governed primarily by the die geometry, the material properties, and the process conditions. This paper employs the rigid-plastic finite element (FE) DEFORMTM 2D software to investigate the plastic deformation behavior of Ti-6Al-4V titanium alloy during ECA extrusion processing. Under various ECA extrusion conditions, the FE analysis investigates the damage factor distribution and the effective stress-strain distribution. The relative influences of the internal angle between the two die channels and the friction factors are systematically examined. Finally, it is designed two set mold and die (including phi=90 degree and phi=120 degree) in equal-channel angular extrusion to compare the simulative data.

Key words: Finite element;Titanium alloy;
Equal-Channel Angular Extrusion